

AVIATION

The Oldest American Aeronautical Magazine

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The T. A. T. "Wasp" powered Ford plane, which was exhibited at the Chicago show.

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Special Features

The Wright "J-6" Series
International Aeronautical Exposition
The Dust Nuisance and Its Elimination

AVIATION PUBLISHING CORPORATION
250 WEST 57TH STREET, NEW YORK



Clarence Chamberlin (left)
with his Wasp powered
Loening Amphibian



The "WASP" Abroad

Clarence Chamberlin, during his recent inspection tour of European airports and airways, took with him a "Wasp" powered plane. The cable received from Mr. Chamberlin tells the story of the motor's reliable performance.

The reliability exhibited by this famous flyer's "Wasp" is an inherent characteristic of Pratt & Whitney engines and has been one of the many factors in winning for them the reputation that the names "Wasp" and "Hornet" are synonymous with dependable aircraft powerplants.

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The Oldest American Aeronautical Magazine

Vol. XXV

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The 1929 Air Tour

In view of the fact that South America is proving itself to be an excellent market for planes and engines of American manufacturers, it would seem altogether fitting to concentrate on the task of increasing South American sales during the year of 1929. This task could be accomplished in a number of ways, the most productive of which would be the sending of sales commissions to the countries below the Panama Canal. However, perhaps the individual manufacturer would not consider the profits involved sufficient to warrant the expenditures necessary for an intensive dissemination and selling campaign.

As an alternative the suggestion is made that arrangements be made for the holding of the 1929 Air Tour in South America instead of here in the United States. At first glance such a suggestion might appear to be out of the question, but as a matter of fact such a tour could be conducted with relatively little expense to the managing officials and the participating manufacturers. The biggest obstacle would be the transporting of the competing airplanes and pilots to Rio de Janeiro, Brazil, which city would be the starting point of the tour. It is possible that the United States Navy, which has already done so much to promote aviation in this country, might be prevailed upon to loan the "Starling," the "Lexington," or the "Langley" for this work.

The tour route to be flown would be around 2,000 mi. in length and include stops in five different South American countries. Starting from Rio de Janeiro the route with perhaps a few intermediate stops, could be as follows: Sao Paulo, Lima, Buenos Aires, Uruguay, Buenos Aires, Argentina, Santiago, Chile—Lima, Peru. With the exception of Sao Paulo each of the cities mentioned is the capital of a country and incidentally the center of that country's aeronautical activities. When the planes had completed their stay in Lima they could next again be placed aboard a Navy carrier and transported back to the United States.

From the standpoint of not only increasing South American interest in American planes and engines, but creating several sales such as expenditures would undoubtedly prove of incalculable value. Flying such a route as suggested would not take long and therefore considerable time, a matter of days, could be spent at each stopping place, which would enable the holding of sight-seeing tours and the intensive conducting of South American sales prospects. As has been the case in American cities visited by Air Tours it is quite probable that the South American cities along the route would supply free gasoline and oil for the winning planes and free lodging accommodations for the winning flying personnel. As regards the matter of servicing the planes, arrangements could be made beforehand for the advance shipping of spare parts, etc., to the various stop-over cities along the route.

In short, the holding of the 1929 Air Tour in South

America would undoubtedly be the greatest boost for export sales that could ever take place. When one considers the sales effect and the publicity value that would be created by the arrival of some 20 or 25 American built airplanes at a South American city, one cannot really regard the idea of such a tour as impractical and out of the question.

Passenger Impressions

THE old saying that "first impressions are lasting impressions" is one well worth while bearing in mind when it comes to the matter of building up air transport traffic in the United States. With the public yet to be completely convinced of the efficiency and advantages of traveling by air, every airline operator will do well to devote considerable attention to the task of "dressing up" his own particular business so that his passengers will obtain the sort of impressions that make for repeat business.

One very important step that can be taken in this respect is that of improving the appearance of the company's fleet and flying personnel by supplying them with appropriate uniforms. Several European and one or two American airlines operators have put this practice into force, with the result that one often hears members of the traveling public commenting in a most favorable way about the business-like way in which their attendants, over which they have traveled, are reported to be. This is particularly true regarding the European lines. Every American tourist who goes to Europe and perceives a European line invariably praises that line for the smart appearance of its fleet and field personnel.

As yet the layman knows relatively little about the mechanical features and flying performances of air transport planes in this country. Whether a plane will travel 100 or 125 m.p.h., whether it will climb 800 or 1,000 ft. per min., or whether it will land at 50 or 75 m.p.h., are items which the average man today does not take into consideration when he contemplates a trip by air. If the plane looks good to him, from the standpoint of cleanliness and construction, he is satisfied. However, if it is ill-matched up and covered with oil and dirt the man's choice to ride in it dies on the spot, even though the plane may be aerodynamically perfect and possess the finest air performance possible.

This same idea holds true regarding an airline company's personnel. If the pilots and field men are going about their various tasks in grease-stained, or rough andumble clothing the airline personnel immediately receives the impression that the firm is operated on a slipshod basis. On the other hand if these men are dressed in neat, well-cut uniforms, in keeping with their respective positions and duties, the air traveler is favorably impressed and forms the opinion that here is an airline operating company which knows its business and is well worth patronizing.

International Aeronautical Exposition

By EARL D. OSBORN

If one were to select the most outstanding general feature of the International Aeronautical Exposition held this month in Chicago, it would be the fact that it was a "quantity" affair. Never in the history of the industry have there been so many aeronautic conventions and meetings held in one city during the period of one week, nor have in many aeronautical products been placed on display at one time, and rarely have so many persons been attracted to a show.

Under the circumstances the Show was well managed, and, of course, highly worth while. However, for those who have been attending aircraft shows since the period of the War, the Chicago Show did not produce the amount of advancement and originality of airplane design that was looked for by many. Much of this type of "border" was stolen by the Detroit Show held seven months ago, but regardless of that fact, airplane designers in this country have been following one another like so many sheep, and although there must today be considerable planes of different sizes, which create the impression of a decided tendency toward standardization, there also exists a well known lack of new and original designs.

Another view regarding the Chicago affair which, while perhaps was not detrimental in regards to the public

exhibits consisted exclusively of made in America products.

However, the foregoing comments are in no way directed at the Show organizers. These gentlemen made the best of what they had and unquestionably obtained considerable experience of value, the results of which should be most noticeable next time. With that, for two



The interior of the First Regiment Armory as it appeared while the Chicago aircraft show was in progress

life years in which to exhibit the great number of products, "luck" had been performed a most commendable bit of work in arranging the exhibits. Due to the packed conditions, elaborate decorations were out of the question and, as a result, there was no particular distinction between exhibits. That, of course, made things rather difficult for the spectator. The only outstanding display from the viewpoint of instantly catching the eye was a Sport Model Waco suspended from the ceiling in a clinical form position.

From the standpoint of the progress of the aeronautic industry in this country the Chicago Show gave evidence of a rather important step. At the beginning of this year there were almost countless individuals and organizations manufacturing airplanes in this country, and many of the planes manufactured were almost identical in design and construction. In fact, in some cases only two examinations resulted in a distinction being made between the plane of one manufacturer and the plane of another. With the last few months, however, many big and important mergers between aircraft designers have taken place. These companies are now adding to their products in an

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to give their distributors and dealers complete lines of models from which the prospective buyers may choose. In short, it might be said that the "buggy crash" of airplane manufacturing now being talked into the whole, and that the mergers and new capitalization of old companies will have a most decided and beneficial effect upon the industry in 1939.

Although the public visited the Show in large numbers and were then repaid the annual out-of-hand exposure, yet, as the week passed it became evident that the chief impression of the Show did not lie in this direction. "Too anxious to get the selling season for airplanes any more" shows it to be the selling season for automobiles. Experience shows people claim that December being the Christmas month, is one of the worst of the year to build a public show. The public was keenly interested and the Show will help to make Chicago renowned, but the public did not come to buy airplanes. Dealers and distributors did, however, come in large numbers from all parts of the country. They came to look over the different models at planes and to make arrangements for their next purchases.

The manufacturers were much more keenly interested in reaching the dealers and distributors than in reaching the general public attendance at the show. Many of the companies, including Fairchild, Advance, Travel Air and Wright, gave luncheons to directors of their field organizations. New representatives were sent and signed up. New contracts were drawn and the sales picture for the following year were laid out. Many of the manufacturers had demonstrative planes out at the municipal airport and when the flying weather was good, which was not most of the time, the activity was very intense and the field traffic director had a busy time. In fact, the actual business done at the show was within the industry and not with the Chicago public.

Although the latest outlines of design remained much the same as at Detroit and there was little originality in design, there was evident a great deal of refinement in the details of design and workmanship. Details of seating, arrangement of instrument boards and controls have been



The exhibit of the de Havilland Biplane, Department of Commerce, at the aircraft exposition

bettered considerably. There was a noticeable improvement in the fitting in of wings to fuselages and in external appearance the planes gave evidence of being more finished products.

Due to the very large number of planes at the show it is impossible to give detailed descriptions, or even to mention the majority of those there. In fact, the whole exhibit was so large that it was rather hard to take in. It was also so scattered that even after three or four days

one found corners that had not yet been explored. The crowds circulating through the various buildings was large and a considerable proportion of these present seemed intelligently interested.

The big cabin planes such as the three-engined Ford, recently had long lines of people waiting to walk through and see what the interiors looked like. The open cockpit planes which had made such an already existing people to look into the cockpits and see the controls and in-



Another view of the main hall of the Coleman

struments boards, attracted considerably more attention than those planes whose seating had the exterior could be seen. A few companies such as Fairchild and Curtiss showed uncovered planes which proved of interest to the crowd. Few of the companies had good exhibits of photographs, or made, given significant and other data in relation to the planes and the company. The technically minded visitor had little chance to see the interior construction of the planes or to look at the detail workmanship. The exterior work of the planes and the details of the wings and controls showed a considerable amount of improvement over Detroit, and there were also less planes in the exhibit which had been put in long before they were finished.

Compared very few from showed a complete line of new models. The most notable exception was the Fairchild company which showed for the first time its low wing, two-seater monoplane, as new Whitehead cabin plane and the new Waco powered cabin plane. The Wright company also made the show the occasion for the first public display of its new low wing engine. The Moos Aircraft showed the Monocouach and the Monocouach, both of them new types, and the American Aircraft showed two new types. Several others from showed new types, but there was no evidence, however, of the industry being ready to make a national show, held in the autumn, the occasion for a display of next year's models.

In the line of design there were comparatively few original ideas in detail or in general conception. Among the exceptions to this statement was the combined ski and wheel controlled by Aerol Servier of Blumenthalport, and the combination wing dash floats and amphibious gear shown by Fisher. There were many others showing almost of wonderful new planes that we are to be brought on in the appropriate, and it is hoped that at least some of them will be built as good as the silver ones.

The mystery of the corners at the show are still outstanding only one type of plane. This is partly due to the large number of small concerns exhibiting and it is probable that out of the total production of planes the majority are now built by concerns who build away from

(Continued on page 200)



A view of the main exhibit hall of the Coleman during the International Aeronautical Exposition

interest was rather disappointing to members of the industry, was the fact that the show was not all, or anywhere near what the name implied. In other words it was not of international scope, and outside of three or four foreign engines and one or two planes the rest of the

The Wright "J-6" Series

Wright Aeronautical Corp. Introduces Three "New Whirlwind" Models to Cover Wide Range of Requirements

In order to complete its line of aircraft engines and provide power plants to cover a wide range of requirements, the Wright Aeronautical Corp., Dayton, N. J., has developed the "J-6" series of engines. The series consists of three "New Whirlwind" models of the four-cylinder, air-cooled, single-cylinder type, having five, seven and nine cylinders and developing 150, 225 and 300 h.p., respectively. The new engines have been built and flight tested over a period of 18 mo. and quantity production will be started on them in the near future.

One of the outstanding features in the design of the new engines is the adaptability of parts. Essentially all of the major parts comprising the power plants, with the exception of crankcases, master rods and cams, are identical. The mounting ring radius is 19 1/2 in., as the same as that of the "J-5" Whirlwind, making it possible to install any one of the J-6 series of engines in place of a J-5 model, providing the engine mounting members do not interfere with the accessories which, in the J-6 engine, are all placed at the rear.

The engines are known as the "New Whirlwind Nine," the "New Whirlwind Seven," and the "New Whirlwind Five," and are designated R-955, R-950 and R-540, respectively, their numbers corresponding to the

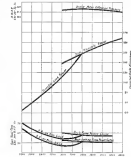


Front View of the "New Whirlwind Five" which develops 150 h.p. This "J-6" model will be placed in production in February, 1959.

displacement in cubic inches. The standard bore is 5 in. and the stroke 5 1/2 in. Because of this 5% increase in bore over the J-5 model, it is possible to gain a piston displacement which produces 300 h.p. in the new nine cylinder engine. By the same means an output of 425 h.p., or approximately the same as that of the J-5 engine, is

obtained from the new seven cylinder model, and 150 h.p. from the five cylinder power plant. The seven and nine cylinder engines develop their rated output at 2,000 r.p.m., while the New Whirlwind Five has a rated speed of 1,800 r.p.m. The compression ratio of these engines is 5-1.

The dry weight of the New Whirlwind Nine is 485 lb., or 145 lb. per h.p., while that of the J-5 model is about 515 lb., representing a reduction of about 30 lb.



A diagram showing the power output and fuel consumption of the new R-540 engine.

even though the new engine has been materially increased in output. The New Whirlwind Seven weighs 425 lb., or 188 lb. per rated hp. This engine, while comparable in output to the J-5 model, weighs 90 lb. less. The New Whirlwind Five weighs 370 lb., or 246 lb. per hp. The overall dimensions and lengths from mounting flange to propeller hub, which are the same for all three models, are 45 in. and 28 5/32 in., respectively. The overall length of the nine cylinder engine is 41 7/16 in., while that of the seven cylinder model is 40 23/32 in., and that of the five cylinder power plant is 40 5/8 in.

The line of the nine cylinder engine will be ready for distribution January 1 and production of the five cylinder model is expected to begin in February, 1959. In May, 1959, production is scheduled to start on the seven cylinder power plant. The external draft is to be

black enamel for cylinders and like gray for crankcase and other aluminum parts. Exposed steel parts will be painted by a suitable non-corrosive coating.

Each engine will be subjected to acceptance tests which will consist of running in until ready for a preliminary test at 2 hr. at 9/10 rated power, at rated speed. Following the preliminary test the engine will be disassembled for inspection and any necessary corrections. The power plant will then be reassembled and subjected to final ac-



A front quarter view of the "New Whirlwind Nine," which develops 300 h.p. and weighs less than 500 lb.

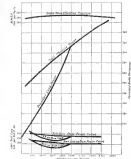
ceptance tests consisting of 5/8 hr. at 9/10 rated power, at rated speed, and 5/8 hr. at rated power and speed. During the final test, power, fuel and oil consumption readings will be taken. The guaranteed maximum fuel consumption for all three models is 55 lb. per h.p. hr. at rated power and speed, and the guaranteed oil consumption 0.25 lb. per h.p. hr. at rated power and speed.

A distinguishing feature in the design of these engines is found in the substitution of a front exhaust system. This is a definite departure from previous practice in this country and permits the use of a front exhaust manifold and the attachment of this manifold and associated cooling standard equipment by the manufacturer. Among the advantages of this system are the reduction in production cost of the manifold and cooling, since it is produced in quantity by the engine manufacturer, and the simplification of engine installation by the airplane manufacturer. At the same time both the head resistance and weight of the exhaust system is greatly reduced, as the entire use is streamlined into the cooling lines. Each engine is provided, as standard equipment, with the front exhaust manifold, which is of the collector ring type and with this new cooling which has recently operated aluminum allowing the crankcase temperature to be lowered from the pilot's seat. All engine controls are placed at the rear of the engine simplifying installation in the plane.

By placing the valve actuating mechanism behind rather than in front of the cylinder it is possible to streamline the rocker boxes, which also aids in the reduction of head resistance. Grouping the accessories at the rear of the engine simplifies installation and provides protection against dirt and weather conditions. The increase in speed resulting from these modifications has been demonstrated

Aluminum alloy cylinder heads are secured and secured over the steel barrel cylinders on each of the J-6 engines. The cylinders are attached to the crankcase by eight steel bolts passing through the cylinder flange and into the crankcase cooling fins. The crankcase assembly consists of four major castings of aluminum alloy which have a sturdy and compact unit. All accessory drives, comprising those for magnetos, oil and fuel pumps, generator and rotary induction system are carried by the rear section. Provision has been made for the installation of both a generator and starter. The cam follower ring carrying the tappet pins is cast integral with the main section of the crankcase, giving rigid and accurate support as well as effective lubrication to the tappets. A number of detail parts are eliminated by this arrangement.

Aluminum alloy pistons, cross ribbed on the under side of the head and lined with full floating bellows pins are employed. The wrist pin, which has an average diameter of 7/16 in., subject to certain tolerances, is held in place by expanding spring wire locks which prevent wearing the cylinder walls. Wrist pins and cylinder walls are lubricated by oil spray from the crank and lower pin bearings. Piston heads are slightly concave in shape and this



A graph showing the fuel consumption of the "New Whirlwind" engine, at full throttle and best engine, and the power curves for the engine at full throttle and on propeller load.

feature, in conjunction with the internal shape of the cylinder head, produces an almost perfect spherical combustion chamber.

As is usual in Wright engines, the connecting rods are alloy steel forgings and consist of a new piston master rod and the articulated rods. Wrist pin and knuckle pin bearings are of bronze pressed into the reinforced head and the crank pin bearing is of semi-bronze metal, steel backed and pressed, and dovetailed into the big end of the master rod.

The single throw, two plane crankshaft is made from alloy steel forgings and is counterbalanced to eliminate vibration. The crankshaft is drilled to provide oil passages. (Continued on page 2912)

The Dust Nuisance and Its Elimination

By WALTER E. BURTON

THE dust nuisance is becoming a real economic factor at most airports of any consequence anywhere. No detailed information is available, but it is nonetheless a fact that a fair-sized percentage of flying field visitors are discouraged by the matter of taking rides on the result of receiving a dust bath first.

Everybody who has visited a flying field in dry weather knows the process involved in dusting the spectators. A plane lands and pulls up to the field edge for the purpose of discharging its quota of passengers and taking on others. It then swings alone, heading for the field again. The airplanes of the propeller turn back the loose bits of dirt, seed and even gravel on the ground behind the plane, and effectively spreads it over practically everything in the vicinity, except the pilot and his passengers, and those who take refuge behind shelter.

Should Consider Dust Problem

Since no progressive field operator dares to drive away patrons with such a disagreeable and unhealthy thing as dust, a consideration of possible methods of dust elimination ought to be a part of every airport program.

Very little effort seems to have been spent in reducing dust as being fields in this country. Fortunately, some fields, such as the London Airport at Cambridge, have surfaces which are naturally free from dust.

"We are particularly fortunate at London Airport inasmuch as we are not faced with the dust problem," Charles E. Plunk, public relations director, writes. "Our airport, a river bottom field, will covered with a strong mat of blue grass. The space in front of our hangars is cordoned, and we find this does away with the dust problem there. When the city begins to construct new hangars that are to be used in the municipal airport, of which London Airport is a part, we will undoubtedly lose the advantage of grass."

This points to one possible solution of the dust problem, that of maintaining a good soil of blue grass, or

some other variety of grass. Of course, on some of the lower fields, or those located where the soil is not fertile, it is difficult to obtain a good growth of grass. It is true, also, a great many seeded fields become dusty with tan.

Harry H. Rice, chief of the airport section of the Department of Commerce, says that, in general, the problem of dust control on airport landing areas is being handled either by the growth of a tough and on the landing area, or by periodic applications of road oil. The latter method is being used by a number of airports located in arid regions where the growth of a satisfactory soil would be practically impossible without irrigation.

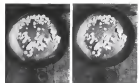
A lot of the success of grass satisfactory for airport use has been prepared by the Department of Agriculture, in such, in part, as follows:

"There is no one grass or mixture of grasses that can be expected to produce satisfactory turf on a landing field for airports in all parts of the United States. In the northern half of the country, it is likely that a mixture composed of 80 per cent Kentucky blue grass and 20 per cent ryegrass will answer fairly well for most purposes. In the southeast, however, the proportion of ryegrass can be increased to good advantage, and in some of the soil soils such as are encountered in the New England states, a mixture of bent grass and ryegrass should give good results. In the blue grass region of Kentucky and adjoining states, there is probably nothing that will form a tougher turf than Kentucky blue grass."

In the hazy southern part of the United States some timothy could perhaps be added to the mixture to advantage. For the southern states there is nothing that is more generally adapted than Bermuda grass. On the low, moist lands in the extreme southeast, carpet grass (Stenotaphrum) grows better results than Bermuda grass. In the arid and semi-arid sections of the United States, there are very few grasses that will grow without irrigation in the northern part of the Great Plains region, where the rainfall is not too small, bromus grass or crested wheat grass would doubtless serve the purpose as well as

anything that is available. Under irrigation, the Kentucky blue grass and ryegrass mixture should do well from Oklahoma north, and Bermuda grass south of the general region. From the brief summary of the available grasses above, it can be seen that practically every airport, save remote sparsely situated airports, has grasses that are best suited for the particular conditions.

"For excellent results, the Bermuda grass should be sown at the rate of 25 to 35 lb. per acre and the mixture of Kentucky blue grass and ryegrass at the rate of about



At the left are shown a number of grasses of various thicknesses as they appear when first removed from the seed sower. At the right, the same samples are shown after exposure to the air in a fairly dry room for periods of 30 days. The grasses already have absorbed some of the moisture in the atmosphere and have started to flourish.

100 to 150 lb. per acre. Good stands can be obtained with much less seed but more time is required."

The use of sods before hangars is satisfactory when planes are wheeled a distance from the hangars before the engines are started. Careless on fields presents the form of smooth, dirt-free surface, but become just as dusty as untreated ground. The Boston Airport at East Boston, Mass., is surfaced with sods. No attempt has been made to get rid of the dust and earlier periods which cause a great deal of annoyance and trouble, according to Laurel C. E. Shanks, who is connected with the airport. He suggests, as a possible remedy, the ceding of the surface.

Among the other methods of dust prevention, or, possibly, they remain silent concerning and treating with calcium chloride. Concrete is the most permanent material for the reducing of dust immediately in front of hangars, but it is also expensive. Its use has been restricted largely to airports essentially able to afford a high first cost. Maj. John Perry, manager of the Cleveland Airport, one of the largest and most modern in the country, has the following to say in regard to concrete and other methods of dust elimination.

"My experience has led me to believe that in most cases the area given over to hangar space, concrete should be made solid, and should extend not approximately 200 ft. from the building line. The field beyond this it is covered with grass gives fairly very little dust. However, where grass has not been grown, and it is not the intention to seed grass, I have found that calcium chloride is a very good dust-reducing agent without the water emulsion which arises when oil has been applied to a surface. One condition at Cleveland has been greatly aggravated by the fact that our plane movements have multiplied much more rapidly than it has been possible to develop seed."

The Cleveland Airport is now the forefront when it comes to dust, largely because of the many planes using the field, as Major Perry has pointed out. Previous for

the elimination of the dust nuisance are being considered, and concrete will be applied as soon as possible.

Heavy oil has, for a long time, been widely used on highways for the laying of dust, and it is only natural that it has been applied to airports. Some fields have found that oil from the exhausts of airplanes and motor-vehicle engines serves fairly well. One or two instances of the collecting of waste oil from all nearby garages for use on the driving area of a local airport have been reported. This method was found to be inconspicuous, for the waste oil could be obtained for almost nothing. The use of light oil such as that refined from creosote requires frequent treatment of the field, else the subsequent dust produced after the oil is "worn out" will be worse than if no oil had been used at all. This also holds true for heavy road oil, when a long period of time is considered.

Although oil is one of the most efficient dust layens, it has been found objectionable because of its "sticky" properties, and because it is likely to impair anything that it touches. It also produces a hard surface which has a tendency to break up and form a hard, lumpy field. In addition to this it is somewhat difficult to apply properly. A suggested reason of application is to move a truck on a two-wheeled cart, not attach to the back a pipe protruding in another direction parallel to the surface of the surface, which has holes drilled every inch or so along its length. Oil flows out through the holes, the rate being regulated.



Using a grain drill attachment as a means of applying calcium chloride when a very large surface is to be covered.

by a suitable vehicle. The construction of such an inexpensive device would be found worthwhile where considerable oil is used.

The calcium chloride treatment, the other means of controlling the dust, is a comparatively new one in its application to airports. For a long time it has been known that calcium chloride is highly hygroscopic. That is, it readily absorbs and retains moisture from the atmosphere. It was used as a drying agent in the laboratory before being put to commercial use. Gradually it came into popularity as a dust-laying material. When applied to a dusty surface, the white, flaky calcium chloride immediately begins to absorb moisture from the air, and in five or six hours has completely dissolved into the dust, (Continued on page 2000)



Very observant, taking and drawing photos on the line at Logan Field, Baltimore, Md. Note the absence of dust at this grass covered field, even though the engines of the planes are being "taxied up."

MUSKOGEE OIL—Organization of the Olay Asphalt Co. has been completed, and the firm has purchased the dist. of the Olay Trunk Co., Okla. City, lying southeast of the city. Dan Watt, secretary-treasurer, announces that production will begin immediately following.

The SENIOR AIRSEDAN



EIGHT PLACE—DUAL CONTROL

Specifications

Weight Empty	2,000 lbs.
Wing Area	38 sq. ft.
Wing Area	402 sq. ft.
Length	27 ft. 9 in.
Overall Length	3,100 ft.
Seating Capacity	2 Pilot, 4 Passengers

Performance

High Speed (Sea Level)	111 m.p.h.
Cruising Speed	110 m.p.h.
Landing Speed	45 m.p.h.

Power Plant

Engine	Waco
Horsepower	420
Fuel Capacity	540 gals.
Oil Capacity	110 gals.

Equipment

Starter, Radio, Wind Propeller Governor, Air Speed Indicator, Navigation Lights, Telemeter, Altimeter, Clock, Pitot-Static System, Fuel, Oil Pressure, and Oil Temperature Gauges, Air Corps Theories, Brakes and Fuel Valve, Exhaust Muff, Anti-Coke Nozzle.

Price, \$18,500

Financing and Field, Marysville, Mich.

Buhl Aircraft Company
MARYSVILLE, MICHIGAN

THANK YOU for AVIATION

AVIATION
December 12, 1938

International Aeronautical Exposition

(Continued from page 1981)

one type. Several of the leading manufacturers were their successors, however, in concentrating on one type. At the Chicago Show, though, there was a noticeable increase in the number of firms that were handling several different types. This tendency is partly due to new models being brought out by old established firms and partly due to conclusions of companies building diversified types of planes. The main hall of the Coliseum was largely taken up by these exhibits. The Looming, Keystone and Travel Air exhibits were grouped together while next to them was the Whiskay, Curtiss and Curtiss-Mohrman combination. Each had a corner at one end of the hall. American Eagle and Moaco Aircraft occupied nearby space. In the sunny areas and in the three side rooms the majority of the manufacturers showed only one model. Buhl, Stearns, Seawind, Cessna each showed two sizes of planes but only Buhl stuck to its general design type.

In spite of the increased production of many of the planes there does not seem to be any tendency toward reduction in price. In fact, if anything, prices are higher than they were last year. Most of the manufacturers are including a larger number of expensive accessories in their list price than was formerly the case, but the main cause for the increase is the fact that most planes this year are using bigger engines than was the case last year, and



The exhibit of Command-Aire, Inc., is the first Ryan Brougham. This firm featured six planes and the "Brougham" for comparison.

that there has been little decrease in the cost of the engines. The selling costs of planes have also gone up over last year and more liberal allowances are being made to dealers and distributors.

No small flying boats were on exhibit at the Show. In view of the multiplicity of similar types in the land planes it is curious that no one has succeeded in manufacturing a small flying boat and putting it on the market in a price which would be attractive. Maybe next year there will be nearly as many boats and amphibians as there are two-seaters today, for it certainly seems as if there were an opportunity going to waste.

Large amphibians were well represented by Whiskay, Looming and Polder while Brougham presented a Biplane powered flying boat. These planes, though, are entirely out of reach of the pocketbook of the ordinary citizen, and both

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in their cost and the elaborateness of their fittings they fall into the class of private yachts.

The engine exhibits were perhaps even more of the plane exhibits. Most of them seemed just to be thrown into some corner or up against a wall without any attempt at decoration or adornment. However the Wright company display was really artfully arranged. The space was separated by a beam and a little plantation of evergreens and there was an attractive background of carpets. Though the engine displays were not audibly abated up, the whole surrounding gave an impression that here was a substantial and dignified company.

One of the most interesting features of the show was the great growth in the power range of engines. The designer of planes now has a choice of power, ranging from 50 to 500 hp. and there are no longer any important gaps to be filled. From 50 to 200 hp. there are several engines of different makes available with the rated power very closely spaced. In the powers above 200 the Pratt & Whitney, the Wright, Curtiss, and the Jupiter engines are the only ones available, but these are simply satisfactory. It is particularly in the field under 150 hp. that there is now a choice of a variety of engines by different makers. Not only is there a large number of models but there are also several four-cylinder-in-line engines, both vertical and inverted. Some of the engines at the Show had not as yet been run, and there are only a few in the low horse-power class which have really tested the test of time, so that both the plane manufacturer and the airplane buyer are somewhat at a loss to know what to do.

However, as there are several engines of approximately the same power, the manufacturer of planes is in a position to design his plane and to be pretty sure that by spring he will be able to get a decent engine.

You Engage More Development Possible

The need for a two-seater plane of comparatively low horse power has long been evident and these new engines will make possible a great development in this direction. The Detroit Show furnished this development and there were several types exhibited. A few of these were also at the Chicago Show, but on the whole the engine attention has held back any great quantity production of most of the firms. Most of these two-seaters are open cockpit planes and the manufacturer of the biplane, who has done his best in the closed two-seater field, is now getting out an open cockpit job along with the closed cabin model. The two-seater in contrast to the other planes in the Show is still far from standardized. The three-seater open cockpit plane is almost invariably a biplane, but when it comes to the two-seater almost anything can be expected. In the two-seater class there is much originality of design and it will take the public some time to decide which type it likes best. Most of the open cockpit planes are designed to be a continuation sport and school plane. The Swallow T-P which is designed primarily as a training plane is the one exception to the rule. Several use and sport use are considerably quite different and the Swallow company would seem to have taken a wise step in its specialized type.

One of the few other specialized planes is the Gates-Day passenger flying plane. This plane is designed primarily for short passenger hops and sight-seeing flights. It carries four passengers in an open cockpit, which is easy to get in and out of, and is designed to meet the requirements of easy landings and take-offs, rather than the requirements of a cross country plane. E. M. Laird has also added a second type of plane with his new Waco powered closed cabin biplane.

The accessories were arranged in a gallery surrounding



A WACO-35 with OX5 motor of the record set by Ed Hedeen at last week's record flight.



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AVIATION
December 13, 1938

the main hall, and in two large rooms at either end of the hall. Many of the exhibitors are accustomed to exhibiting in shows of other trades and naturally experience has taught them how to make attractive displays. More space was assigned to them, on either, they were able to restrict the size of their display to the size of the space, and arrange it in better style. The accessories were more numerous than at Detroit and also there was a lesser number of cheap concerns showing products which had little to do with the industry. The variety and scope of



The Henry "Kitten," which was displayed in the Aircraft. This plane was equipped with a combined lift and wheel landing gear.

the aircraft field was well illustrated by the accessory displays. Designers of airports and airways had booths, and the lighting equipment and systems of communication between airports were also displayed. Then there was a division of engine accessories running all the way from crankshaft bearings to spark plugs, magnets, and ignition coils. Much space was naturally taken by the test and lubricant companies. Raw material for planes such as steel tubing, duralumin, wood, cloth, paints, varnishes, etc., was also displayed. Finished parts for airplanes were quite numerous, including tires, wheels, brakes, instruments, etc., but there will probably be a considerable extension of this field before the next autumn show.

The show was the occasion for meetings and dinners of various kinds. At all times of the day and night there were several informal functions going on, and many unofficial gatherings not scheduled in advance but equally effective. There were many old timers present who have long been connected with the industry but there were also so many new faces that it might have been the occasion in which the industry has grown and changed. The officially named hotel had also been named as the official hotel for a gathering of oil men and for a gathering of amusement park men and also for the American Milk Goat Association. At a breakfast every facility of the hotel was given and many of the meetings could not find sufficient space to accommodate those who wished to be present.

The Aeronautical Chamber of Commerce meetings lasted over the course of several days. Much time was spent in discussing the future policy in regard to aeronautical exhibits. It was decided in principle that no exhibits would be approved which were run by professional promoters and where the profits, if any, did not revert back to the industry. It was also decided in principle that there would be only one national show run by the Aeronautical Exposition Corp. Neither the exact time nor place for the next national show were decided upon but an autumn show seemed to be favored. It seemed to be the feeling of most of those present that it would be impossible to have the

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country to one nation show a year especially in view of the large number of cities which have asked for attention. It was therefore suggested that active help be granted to the presentation of shows in certain cities and that local shows would be approved where the active help of the Chamber was not requested.

The Flying School Committee headed by "Curry" Jones, which has been studying the question of flying schools, has



The exhibit of the Pratt & Whitney Aircraft Co., which was located at the south end of the Coliseum main hall

and made certain recommendations which were to be acted upon by a permanent body of which "Phil" Love of St. Louis was appointed chairman. The permanent committee will consist of seven men appointed by regional districts. The recommendations suggested that schools should use licensed pilots and licensed pilots as instructors, and that the planes should be inspected daily. It was also



The top wing, open cockpit monoplane, the "Flying Dutchman" exhibited by Seivley Aircraft Corp.

recommended that thorough ground school be given along with flight instruction and that a minimum flying course should at least lead to a private pilot's license.

The Commercial Aircraft Manufacturers' Section of the Chamber under the able and patient chairmanship of J. Don Alexander waded through a pattern which contained 25 different subjects for discussion. A standard form of rules agreement between manufacturers and distributors was agreed upon. A meeting of purchasing agents to be held in Wichita on January 22 was decided upon. Professor Klemm's report on the testing of airplanes as to

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be made according to the table given below. If the ground has been previously oiled, a somewhat heavier coating should be given. The second application should be made from four to six weeks later. It is rarely that a third application will be needed in a season. In subsequent years, it will be found that less and less chloride is necessary, because some of that previously applied will still be active.

The following table, prepared by the Columbia Chemical Co., division of the Pittsburgh Plate Glass Co., of Warrenton, O., indicates the quantity required for different surfaces.

Surface	First Application	Second	Third
Discs	1/16	1/16	1/16
Gravel	1/16	1/16	1/16
Sand	1/16	1/16	1/16
Smooth	1/16	1/16	1/16

The quantities listed are given in lb. per sq. yd.

Calcium chloride is produced in several states, including New York, Michigan and Ohio, and the prices are about the same in each state at the time of writing. The price in Ohio is \$22.75 per ton, making the cost of treating a field in the Middle West or in the eastern states about 2 1/2¢ to 3¢ per sq. yd. per season. The material is shipped usually in 150 lb. drums, or 300 lb. bags, and prices quoted are "f.o.b."

An additional use for calcium chloride may be mentioned in connection with flying fields. Ruts, cracks and other depressions requiring filling, in dry weather, will not become immediately covered again if the filling material is mixed with a small quantity of the chloride. The moisture retained has a binding action which makes the repair permanent. The material can also be mixed with concrete to prevent its freezing when laid in cold weather.

Of course, the applying of a dust directly to an airport is an improvement to be determined by the financial condition of the airport. Usually only the spare material in front of hangars and the area occupied by spectators need be treated, and such areas are seldom large enough to make the cost prohibitive. Doubtless, if the increased business resulting from the removal of this source of irritation to the person and vehicle is considered, the applying of a dust suitable will be found to be a distinctly profitable investment.

The Wright "J-6" Series

(Continued from page 2085)

steps giving positive pressure lubrication to the bearing surfaces. The overall length of the standard crankshaft is 21 1/2" in.

The valve mechanism, including the push rods, is completely enclosed, and the housing for the rocker arms is cast integral with the cylinder head. Hand-operated steel car followers operate through rollers of the same material resting on the cam ring, and push rods of hollow steel taking stand with cast hardened steel ball ends actuate the forged steel rocker arms. The rocker arms are carried on special ball bearings lubricated by the "Avalanche" or Zerol, pressure systems, and have provision for the adjustment necessary for correct valve operation.

Tapered valves of ample area are used with a solid stem for the inlet and hollow stem for the exhaust valves. The diameter of the inlet valve across the head is 2 1/2 in. and that of the stem is 1 1/2 in. The exhaust valve diameter across the head is 2 1/2 in. and the diameter of the stem is 1 1/2 in. Both inlet and exhaust valves have a lift of 9/16 in. Three springs are fitted to each valve insuring reliability so the valve can be

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1 year Vol. 141	from Sep. 1, 1984 to Dec. 31, 1984	1984
1 year Vol. 142	from Jan. 1, 1985 to Apr. 30, 1985	1985
1 year Vol. 143	from May 1, 1985 to Aug. 31, 1985	1985
1 year Vol. 144	from Sep. 1, 1985 to Dec. 31, 1985	1985
1 year Vol. 145	from Jan. 1, 1986 to Apr. 30, 1986	1986
1 year Vol. 146	from May 1, 1986 to Aug. 31, 1986	1986
1 year Vol. 147	from Sep. 1, 1986 to Dec. 31, 1986	1986
1 year Vol. 148	from Jan. 1, 1987 to Apr. 30, 1987	1987
1 year Vol. 149	from May 1, 1987 to Aug. 31, 1987	1987
1 year Vol. 150	from Sep. 1, 1987 to Dec. 31, 1987	1987
1 year Vol. 151	from Jan. 1, 1988 to Apr. 30, 1988	1988
1 year Vol. 152	from May 1, 1988 to Aug. 31, 1988	1988
1 year Vol. 153	from Sep. 1, 1988 to Dec. 31, 1988	1988
1 year Vol. 154	from Jan. 1, 1989 to Apr. 30, 1989	1989
1 year Vol. 155	from May 1, 1989 to Aug. 31, 1989	1989
1 year Vol. 156	from Sep. 1, 1989 to Dec. 31, 1989	1989
1 year Vol. 157	from Jan. 1, 1990 to Apr. 30, 1990	1990
1 year Vol. 158	from May 1, 1990 to Aug. 31, 1990	1990
1 year Vol. 159	from Sep. 1, 1990 to Dec. 31, 1990	1990
1 year Vol. 160	from Jan. 1, 1991 to Apr. 30, 1991	1991
1 year Vol. 161	from May 1, 1991 to Aug. 31, 1991	1991
1 year Vol. 162	from Sep. 1, 1991 to Dec. 31, 1991	1991
1 year Vol. 163	from Jan. 1, 1992 to Apr. 30, 1992	1992
1 year Vol. 164	from May 1, 1992 to Aug. 31, 1992	1992
1 year Vol. 165	from Sep. 1, 1992 to Dec. 31, 1992	1992
1 year Vol. 166	from Jan. 1, 1993 to Apr. 30, 1993	1993
1 year Vol. 167	from May 1, 1993 to Aug. 31, 1993	1993
1 year Vol. 168	from Sep. 1, 1993 to Dec. 31, 1993	1993
1 year Vol. 169	from Jan. 1, 1994 to Apr. 30, 1994	1994
1 year Vol. 170	from May 1, 1994 to Aug. 31, 1994	1994
1 year Vol. 171	from Sep. 1, 1994 to Dec. 31, 1994	1994
1 year Vol. 172	from Jan. 1, 1995 to Apr. 30, 1995	1995
1 year Vol. 173	from May 1, 1995 to Aug. 31, 1995	1995
1 year Vol. 174	from Sep. 1, 1995 to Dec. 31, 1995	1995
1 year Vol. 175	from Jan. 1, 1996 to Apr. 30, 1996	1996
1 year Vol. 176	from May 1, 1996 to Aug. 31, 1996	1996
1 year Vol. 177	from Sep. 1, 1996 to Dec. 31, 1996	1996
1 year Vol. 178	from Jan. 1, 1997 to Apr. 30, 1997	1997
1 year Vol. 179	from May 1, 1997 to Aug. 31, 1997	1997
1 year Vol. 180	from Sep. 1, 1997 to Dec. 31, 1997	1997
1 year Vol. 181	from Jan. 1, 1998 to Apr. 30, 1998	1998
1 year Vol. 182	from May 1, 1998 to Aug. 31, 1998	1998
1 year Vol. 183	from Sep. 1, 1998 to Dec. 31, 1998	1998
1 year Vol. 184	from Jan. 1, 1999 to Apr. 30, 1999	1999
1 year Vol. 185	from May 1, 1999 to Aug. 31, 1999	1999
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1 year Vol. 187	from Jan. 1, 2000 to Apr. 30, 2000	2000
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1 year Vol. 189	from Sep. 1, 2000 to Dec. 31, 2000	2000
1 year Vol. 190	from Jan. 1, 2001 to Apr. 30, 2001	2001
1 year Vol. 191	from May 1, 2001 to Aug. 31, 2001	2001
1 year Vol. 192	from Sep. 1, 2001 to Dec. 31, 2001	2001
1 year Vol. 193	from Jan. 1, 2002 to Apr. 30, 2002	2002
1 year Vol. 194	from May 1, 2002 to Aug. 31, 2002	2002
1 year Vol. 195	from Sep. 1, 2002 to Dec. 31, 2002	2002
1 year Vol. 196	from Jan. 1, 2003 to Apr. 30, 2003	2003
1 year Vol. 197	from May 1, 2003 to Aug. 31, 2003	2003
1 year Vol. 198	from Sep. 1, 2003 to Dec. 31, 2003	2003
1 year Vol. 199	from Jan. 1, 2004 to Apr. 30, 2004	2004
1 year Vol. 200	from May 1, 2004 to Aug. 31, 2004	2004
1 year Vol. 201	from Sep. 1, 2004 to Dec. 31, 2004	2004
1 year Vol. 202	from Jan. 1, 2005 to Apr. 30, 2005	2005
1 year Vol. 203	from May 1, 2005 to Aug. 31, 2005	2005
1 year Vol. 204	from Sep. 1, 2005 to Dec. 31, 2005	2005
1 year Vol. 205	from Jan. 1, 2006 to Apr. 30, 2006	2006
1 year Vol. 206	from May 1, 2006 to Aug. 31, 2006	2006
1 year Vol. 207	from Sep. 1, 2006 to Dec. 31, 2006	2006
1 year Vol. 208	from Jan. 1, 2007 to Apr. 30, 2007	2007
1 year Vol. 209	from May 1, 2007 to Aug. 31, 2007	2007
1 year Vol. 210	from Sep. 1, 2007 to Dec. 31, 2007	2007
1 year Vol. 211	from Jan. 1, 2008 to Apr. 30, 2008	2008
1 year Vol. 212	from May 1, 2008 to Aug. 31, 2008	2008
1 year Vol. 213	from Sep. 1, 2008 to Dec. 31, 2008	2008
1 year Vol. 214	from Jan. 1, 2009 to Apr. 30, 2009	2009
1 year Vol. 215	from May 1, 2009 to Aug. 31, 2009	2009
1 year Vol. 216	from Sep. 1, 2009 to Dec. 31, 2009	2009
1 year Vol. 217	from Jan. 1, 2010 to Apr. 30, 2010	2010
1 year Vol. 218	from May 1, 2010 to Aug. 31, 2010	2010
1 year Vol. 219	from Sep. 1, 2010 to Dec. 31, 2010	2010
1 year Vol. 220	from Jan. 1, 2011 to Apr. 30, 2011	2011
1 year Vol. 221	from May 1, 2011 to Aug. 31, 2011	2011
1 year Vol. 222	from Sep. 1, 2011 to Dec. 31, 2011	2011
1 year Vol. 223	from Jan. 1, 2012 to Apr. 30, 2012	2012
1 year Vol. 224	from May 1, 2012 to Aug. 31, 2012	2012
1 year Vol. 225	from Sep. 1, 2012 to Dec. 31, 2012	2012
1 year Vol. 226	from Jan. 1, 2013 to Apr. 30, 2013	2013
1 year Vol. 227	from May 1, 2013 to Aug. 31, 2013	2013
1 year Vol. 228	from Sep. 1, 2013 to Dec. 31, 2013	2013
1 year Vol. 229	from Jan. 1, 2014 to Apr. 30, 2014	2014
1 year Vol. 230	from May 1, 2014 to Aug. 31, 2014	2014
1 year Vol. 231	from Sep. 1, 2014 to Dec. 31, 2014	2014
1 year Vol. 232	from Jan. 1, 2015 to Apr. 30, 2015	2015
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operated by one of the springs. The valve springs are hollow and are made from special heat treated spring steel wire.

Oil is forced to the rear of the hollow crankshaft by a pressure pump and is distributed to the bearings under pressure. Excess oil drains into a sump located in the main section of the crankcase between the bottom cylinders. From the sump, a single section pump delivers the oil to the main tank in the plane, passing it through a strainer installed at a convenient point outside of the



A front view of the Wingo R-700, the new seven cylinder model of the new "J-4" series showing the front exhaust manifold and water cooling.

engine. By this means foreign matter is removed from the oil and the strainer is accessible for frequent cleaning. No external oil pipes are used in the lubrication system. This feature precludes the possibility of leakage from that source and prevents excessive churning of the oil in the oil sump. Oil pressure is regulated by an adjustable valve.

Two finger mounted Schaff's magnets at the rear of the engine furnish ignition for the two separately controlled spark plugs in each cylinder. Although the magnets normally operate independently, of course the magnets will operate as one magnet with but a slight reduction in speed.

A special Strobber carburetor of the single barrel type, mounted on the rear section of the crankcase, supplies the mixture which passes from the carburetor to the "diffuser" chamber of the cylinder. This mixture is distributed evenly to all cylinders by the General Electric rotary impeller mounted in the diffuser chamber. This positive control of the mixture, obtained through the particular design of the rotary induction system, eliminates the vibrations which would result from irregular mixture distribution. A "hot spot" is provided above the carburetor which thoroughly vaporizes the mixture. This feature serves to insure smooth operation of the engine when using any of the various types of gasoline. The temperature of the hot spot can be regulated from the pilot's seat in order to obtain maximum efficiency and fuel economy under all conditions. Provision also is made to obtain a supply of clean air to the carburetor at all times.

(Continued on page 2055)



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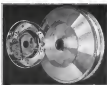
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SIDE SLIPS

By ROBERT R. OSBORN

"A lichen with complete electric lighting installation is included." This quotation is an extract from the newspaper description of a large passenger-carrying airplane under construction at the Fokker plant, and it leads me to wonder in beginning to have the desired effect, or else the power began to add "for the first time in history" at the end of this statement.

A new play has been presented in Paris called "L'aviation," written around the flying activities of that popular young man, and having characters looking very much like him, Archambaud Bernick, and other passengers officially who were concerned with the celebration of his famous flight. If the play is successful in Paris we suppose some producer will import it to Broadway, knowing that it is convenient to make the picture, borrowing space from the main theme.

Hearing that the National Advisory Committee for Aeronautics has built a special wind tunnel equipped with a refrigerating apparatus to test air formations, the famous Aviator is inquiring if he can get a special test run on himself. He says he wants some sort of an official document to carry around to prove in any dispute that it is the cold, which is giving his nose as brilliant red color when he comes down from a flight these days.

At the Chicago show the suggestion, made in one of the meetings, that the Department of Commerce equip all cabin planes to be furnished with safety belts for the passengers, met with enthusiastic approval, according to newspaper reports. With all structure designed right down to a minimum as it is nowadays, it is getting to be a serious matter when the more nervous and powerful passengers acquire the longed-for all out of shape.

One airplane manufacturer already is advertising to the fathers of America that they ought to give their sons airplanes for Christmas. This strikes to us being a splendid idea, and, in order to assure that the son will be pleased with the selection, we would advise the father to make sure that the plane he selects has plenty of room for putting "miscellaneous" things.

Mr. P. H. of Mount Carmel, Pa., sends in the following item from a Philadelphia paper with the comment that the old man drove down, who were known for changes from automobiles and motorcycles to airplanes in flight, are apparently going to be very much in demand in the future for the aeronautical customs inspection service.

The first customs inspection of an airplane in Philadelphia was made yesterday when a plane from Montreal—the NC-152—arrived at Pitman Field, near Haddon. Chief Inspector Fred Benson and his deputy, F. L. Gerner, met the field, examined the plane's papers and her cargo, and then officially permitted it to land.

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We ARE building Ford planes more quickly—but not more hurriedly.

We have increased production to three a week. This does not mean less time and attention devoted to each plane. It means that personnel and facilities have been augmented to the point where a greater production of planes can be accomplished with the same care as heretofore.

There was a strong temptation, of course, to increase production long ago. Orders would certainly have warranted it. Nearly every purchaser has had to wait for delivery of his plane—and we wish to express our profound appreciation of their good-humored patience and forbearance. Also of their amazing loyalty to a standard of safety which originally led to their selection of the Ford plane.

But there was a very good reason for our postponing the decision to make the Ford plane a greater number. 1926 and 1927 have brought almost incredible progress in

aviation. There was always the possibility of a revolutionary development and improvement in airplanes practically overnight. Though the Ford plane had been designed after a searching look into what the future might bring, it was felt inadvisable to decide arbitrarily that anything was not subject to sudden change. To protect our customers from abnormal obsolescence, we determined to go slow on our building program.

We are convinced that the immediate future will bring refinements of present practices and principles which will make the airplane more efficient, more dependable and more economical. But we expect this change to be an evolution with which manufacturing can keep pace. Consequently we now feel buyers of Ford planes run little if any danger that the planes they buy will become obsolete before they have completed their period of usefulness—a period which we know is at least four years. The Stout Metal Airplane Company, Division of Ford Motor Company, Dearborn, Michigan.

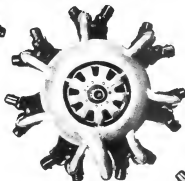
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